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PATENT APPLICATION

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IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Jiansan SUN et al.

Confirmation No.: 6348

Application No.: 10/773388

Examiner: Lisa Solomon

Filing Date: February 5, 2004

Group Art Unit: 2861

Title: Heating Element, Fluid Heating Device, Inkjet Printhead, And Print Cartridge Having The Same and Method Of Making The Same

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TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on October 12, 2006 .

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $120	☐ 2nd Month $450	☐ 3rd Month $1020	☐ 4th Month $1590

☐ The extension fee has already been filed in this application.

☐ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

Respectfully submitted,
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Date of Transmission: November 17, 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Jiansan SUN et al.	Group Art Unit: 2861
Serial No.:	10/773,388	Examiner: Lisa Solomon
Filed:	February 05, 2004	
Title:	HEATING ELEMENT, FLUID HEATING DEVICE, INKJET PRINTHEAD, AND PRINT CARTRIDGE HAVING THE SAME AND METHOD OF MAKING THE SAME	

APPEAL BRIEF

The Appellants respectfully submit this Appeal Brief in response to the Final Office Action mailed on July 19, 2006 and the Advisory Action mailed on October 23, 2006.

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APPENDICES

I. Real Party in Interest

The present application is assigned to Hewlett Packard Development Company L.P.

II. Related Appeals and Interferences

The Appellants' legal representative, or assignee, does not know of any other appeal or interferences which will affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

III. Status of Claims

Claims 1-13 are withdrawn from consideration.

Claims 14-17 have been cancelled.

Claims 18-22 stand rejected and are on appeal.

IV. Status of Amendments

No amendment after Final rejection has been filed.

V. Summary of Claimed Subject Matter

Independent Claim 18 pertains to a method of manufacturing a heating element for a printhead. This method includes forming an insulating layer (12) on a substrate (10), followed etching to remove portions of the insulating layer to define a protruding portion (14) having substantially vertical sidewalls (58) and flanked by two shoulder portions (16). This sequence of steps is depicted by FIGS. 4A and 4B, and described in the paragraph bridging pages 9-10 of the specification (paragraph [0030]). As can been seen from FIG. 4B, etching is performed partially through the thickness of the insulating layer 12 so as to define the protruding portion (14) and the shoulder portions (16). After etching, a conductive layer (20) is deposited on the insulating layer to cover the protruding portion and the shoulder portions as shown in FIG. 4C, and as described on page 11, paragraph [0033]. Next, the surface of the conductive layer is

planarized to expose the protruding portion to thereby form a first conductive trace (22) separate from a second conductive trace (24). This planarizing step is described on page 11, paragraph [0034], and depicted by FIG. 4D. Subsequently, a resistive layer (18) is formed on the planarized surface as shown in FIG. 4E and as described on page 11, paragraph [0035].

Independent Claim 20 pertains to a method for manufacturing a thermal inkjet printhead, which method includes all of the steps discussed above plus the additional step of forming an ink chamber above the resistive layer. The formation of the ink (or firing) chamber (40) is described on page 13, paragraph [0039]. The ink chamber (40) formed by this method is shown in FIG. 2.

VI. Grounds of Rejection to be Reviewed on Appeal

Whether Claims 18-22 are unpatentable over Xu et al. (US 6,785,956) under 35 U.S.C. 103(a).

VII. Argument

Claim Rejection Under 35 U.S.C. §103

In the Final Office Action dated July 19, 2006, the Examiner initially asserts that Xu et al. ("Xu") teaches a method of manufacturing a heating element for a prinhead, which method includes all of the steps recited in Claim 18 (citing col. 5 line 40 to col. 6 line 29, Figs. 3A and 4). Subsequently, the Examiner asserts that Xu "does not explicitly teach the dielectric layer (44, Fig. 3A) as an insulating layer." The Examiner then states that "it is well known that dielectric material does not conduct electricity readily, i.e., an insulator as defined in the Columbia Electronic Encyclopedia, Sixth Edition." According to the Examiner, it would have been obvious "to utilize insulating material for the passivation layer, since it has been held to be [within] the general skill of a worker in the art to select a known material on the basis of its suitability for the

intended use for the purpose of [providing] insulation of the resistive and conductive layers."

In the advisory action dated November 23, 2006, the Examiner states: "The insulating layer of the prior art is not etched through the entire thickness; there is still a protruding portion of the insulating layer left. Furthermore, there is no language in claims 18 and 20 that specify the portions flanking the protruding portion [have] to be the same material. In addition, the limitation of claims 18 and 20 includes the language 'substantially vertical sidewalls'. The term 'substantially' is a relative term, not exact. Therefore, the sidewalls do not have to be exactly vertical."

Standard for establishing a *prima facie* case of obviousness

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Appellants' Rebuttal Arguments

Appellants disagree with the Examiner's assertion that Xu discloses all of the steps recited in Claim 18 except indicating that the dielectric layer 44 could be an insulating layer. It is submitted that Xu fails to disclose all of the steps recited in Claim 18.

Claim 18 recites a method of manufacturing a heating element, which comprises, inter alia:

"forming an insulating layer on a substrate;
partially etching through the thickness of the insulating layer to define a protruding portion having substantially vertical sidewalls and flanked by two shoulder portions." (Emphasis added)

Xu discloses a method of fabricating a fluid-jet printhead, which method includes forming a relatively thick insulator layer 20 on a substrate 10, followed by depositing a dielectric material 44 onto the insulator layer (col. 5, lines 46-58). The dielectric material 44 is then etched to define the resistor length dimension L (col. 5, lines 58-65). As shown in FIG. 3A, the etched dielectric structure 44 is formed by etching through the entire thickness of the dielectric layer to remove portions thereof. The resulting etched structure 44 does not have shoulder portions. Moreover, the resulting etched structured 44 has sloped walls. Xu discloses that "it is desirable to produce conductors 42A and 42B having sloped walls" (col. 4, lines 60-65) (emphasis added). Therefore, the etched dielectric structure 44, which abuts conductive traces 42A and 42B, also has sloped sidewalls. Furthermore, Fig. 3A depicts the dielectric structure 44 as having sloped sidewalls. As such, Xu fails to disclose the "partially etching" step recited in Claim 18.

The Examiner asserts that "there is no language in claims 18 and 20 that specify the portions flanking the protruding portion has to be the same material." However, the claim language of Claim 18 makes it clear that etching is performed on a single insulating layer to form the protruding portion and the shoulder portions. As such, the protruding and the shoulder portions are formed from the same insulating layer as a result of etching. In the phrase "partially etching through the thickness of the insulating layer," the term "the insulating layer" refers to the same insulating layer that is formed in the preceding step. Furthermore, Appellants' specification, together with the drawings, provides the antecedent basis for this interpretation. By contrast, Xu's method involves forming two different layers, a lower insulating layer 20 and an upper dielectric layer 44, on

the substrate 10 followed by etching through the entire thickness of the upper layer to form the etched structure 44 shown in FIG. 3A.

The Examiner also asserts that "the term 'substantially' is a relative term, not exact" and "[t]herefore, the sidewalls do not have to be exactly vertical." It appears from this assertion that the Examiner interprets the term "substantially vertical sidewalls" to include "sloped sidewalls." The term "substantial" is a meaningful modifier implying "approximate" rather than "perfect." *Liquid Dynamics Corp. v. Vaughan Co., Inc.*, 355 F.3d at 1368 (Fed. Cir. 2001). Even so, Appellants' specification, including the drawings, makes it clear to one of ordinary skill in the art that the term "substantially vertical sidewalls" does not encompass "sloped sidewalls." The Background section of Appellants' specification highlights the problem associated with forming conductive traces with sloped sidewalls. Appellants' method avoids such problem by forming insulated conductive traces without sloped surfaces. As such, the Examiner's interpretation of the term "substantially vertical" contradicts the meaning of the term in the context of the written description.

During examination proceedings, claims are given their broadest reasonable interpretation consistent with the specification as it would have been interpreted by one of ordinary skill in the art. *In re Graves*, 69 F.3d 1147, 1152, 36 USPQ2d 1697, 1701 (Fed. Cir. 1995) (Emphasis added).

It is submitted that the Examiner's interpretation of the phrase "partially etching through the thickness of the insulating layer to define a protruding portion having substantially vertical sidewalls and flanked by two shoulder portions" is not consistent with Appellants' written description and is not reasonable.

Because Xu fails to disclose or suggest all of the limitations recited in Claim 18, Xu cannot support a *prima facie* case of obviousness regarding the subject matter of Claims 18. Accordingly, Claim 18 is patentable over Xu. Independent Claim 20 includes all of the steps recited in Claim 18 and is separately patentable over Xu for at least the same reasons set forth for Claim

18. Dependent Claims 19, 21, 22 are also patentable over Xu at least by virtue of their dependency.

VIII. **Conclusion**

Reversal of the final rejection is respectfully requested and a Notice of Allowance is solicited.

Date: November 17, 2006

Respectfully submitted,

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CLAIMS APPENDIX

1. (Withdrawn) A heating element comprising:

a substrate;

a conductive layer disposed over the substrate to define a first conductive trace and a second conductive trace with a spacer therebetween; and

a resistive layer covering the first conductive trace, the second conductive trace and the spacer, wherein the resistive layer at least partially electrically connects the first and the second conductive traces.

2. (Withdrawn) A heating element according to Claim 1, wherein the resistive layer has a first surface abutting the conductive traces and the spacer, and a second surface opposite the first surface, wherein the second surface is at least substantially planar.

3. (Withdrawn) A heating element according to Claim 2, wherein each of the conductive traces has a sidewall facing the other conductive trace, the sidewall being at least substantially perpendicular to the first surface of the resistive layer.

4. (Withdrawn) A heating element according to Claim 1, wherein the spacer is made of the same material as the resistive layer.

5. (Withdrawn) A heating element according to Claim 1, wherein the spacer comprises an electrically insulating material selected from a group consisting of BPSG, PSG, TEOS, and silicon nitride.

6. (Withdrawn) A heating element according to Claim 1, wherein the spacer and the conductive traces have respective surfaces abutting the resistive layer, the surfaces being at least substantially coplanar with respect to each other.

7. (Withdrawn) A heating element according to Claim 6, wherein the surfaces are chemical mechanically polished.

8. (Withdrawn) A heating element according to Claim 1, wherein the substrate comprises an insulating layer on which the conductive layer is disposed over.

9. (Withdrawn) A heating element according to Claim 8, wherein the spacer is a protruding part of the insulating layer.

10. (Withdrawn) A heating element according to Claim 1, wherein the resistive layer is at least substantially uniformly thick.

11. (Withdrawn) A fluid ejection device comprising:

a substrate;

a conductive layer disposed over the substrate to define a first conductive trace and a second conductive trace with a spacer therebetween;

a resistive layer covering the first conductive trace, the second conductive trace and the spacer, wherein the resistive layer at least partially electrically connects the first and the second conductive traces; and

a barrier layer adjacent the resistive layer that defines a fluid chamber in which fluid may be heated and ejected therefrom.

12. (Withdrawn) A printhead comprising:

a substrate;

a conductive layer disposed over the substrate to define a first conductive trace and a second conductive trace with a spacer therebetween;

a resistive layer covering the first conductive trace, the second conductive trace and the spacer, wherein the resistive layer at least partially electrically connects the first and the second conductive traces; and

a barrier layer adjacent the resistive layer that defines a firing chamber in which fluid may be heated and ejected therefrom.

13. (Withdrawn) A print cartridge comprising:

a fluid reservoir; and

a printhead fluidically coupled with the fluid reservoir, wherein the printhead comprises a substrate; a conductive layer disposed over the substrate to define a first conductive trace and a second conductive trace with a spacer therebetween; a resistive layer covering the first conductive trace, the second conductive trace and the spacer, wherein the resistive layer at least partially electrically connects the first and the second conductive traces; and a barrier layer adjacent the resistive layer that defines a firing chamber in which fluid from the reservoir may be heated and ejected therefrom.

14-17. (Cancelled)

18. (Previously presented) A method of manufacturing a heating element for a printhead, said method comprising:

forming an insulating layer on a substrate;

partially etching through the thickness of the insulating layer to define a protruding portion having substantially vertical sidewalls and flanked by two shoulder portions;

depositing a conductive layer on the insulating layer to cover the protruding portion and the shoulder portions;

planarizing a surface of the conductive layer to expose the protruding portion to thereby form a first conductive trace separate from a second conductive trace; and

forming a resistive layer over the planarized surface of the conductive layer and the exposed protruding portion.

19. (Previously presented) A method according to Claim 18, wherein the resistive layer is at least substantially uniformly thick.

20. (Previously presented) A method for manufacturing a thermal inkjet printhead, said method comprising:

forming an insulating layer on a substrate;

partially etching through the thickness of the insulating layer to define a protruding portion having substantially vertical sidewalls and flanked by two shoulder portions;

depositing a conductive layer on the insulating layer to cover the protruding portion and the shoulder portions;

planarizing a surface of the conductive layer to expose the protruding portion to thereby form a first conductive trace separate from a second conductive trace; and

forming a resistive layer over the planarized surface of the conductive layer and the exposed protruding portion; and

forming an ink chamber above the resistive layer.

21. (Previously presented) The method of claim 20 further comprising:

forming a passivation layer between the resistive layer and the ink chamber, said passivation layer being made of an insulating material.

22. (Previously presented) The method of claim 21 further comprising:

forming a cavitation barrier layer between the passivation layer and the ink chamber.

EVIDENCE APPENDIX

NONE

RELATED PROCEEDINGS APPENDIX

NONE